Broadcasters can take advantage of near-term revenue opportunities – and build their own digital operating expertise — by using the DTV bandwidth for creative new entertainment and business services. Adopting the efficient High Definition Zero (HD0) formats enables stations and networks to expand into HDTV when the market is ready. A natural migration path would be towards High Definition One (HD1), a scaleable extension of HD0.

This evolutionary approach also gives broadcasters time to develop and implement new business models that are needed to take advantage of the digital TV opportunities. For example, DTV's multicasting capability allow broadcasters to compete with multichannel providers, such as cable or direct broadcasting satellite systems. The same multicast facilities also enable TV licensees to deliver closed-circuit video and to download data to personal computers.

By conserving spectrum – i.e. using only one-third to one-quarter of the 6 Megahertz channel space – the HD0 format allows broadcasters to multiplex their signals; three or more digital channels can be transmitted in each spectrum assignment. This means that a broadcast licensee can offer several channels of video and/or data. These "extra" channels can be used for a variety of revenue-producing services, such as:

- time-shifted video services,
- community-focused content (e.g. "zoned" news reports, traffic cameras)
- sports/weather/stock data
- targeted/addressable advertising
- classified advertising and addressable commercials
- direct marketing/transactional merchandising
- special-interest video programs
- leased video for closed-circuit business/educational/institutional applications
- pay TV
- data transmission, e.g. downloaded Web files.

These and other revenue-generating opportunities represent the first fundamental change in the broadcast TV revenue stream in 50 years. Many of these new services do include advertising, often from sources (such as classified advertising) previously untouched by broadcasters

Audience appetites – forever fickle – are ready for a new buffet with the advent of DTV. Several recent studies confirm that viewers do not want to see conventional TV fare in HDTV format. They will not buy new TV sets merely for such programming. Hence, HD0 also represents a more immediate route toward creating the services that viewers seem to want.

An evolutionary process is appropriate as broadcasters move into Digital TV. By adopting a scaleable and Upgradeable SDTV format during the transition

period, broadcasters can profit at every step, with minimal risks, as viewers, advertisers and programmers begin to embrace Digital TV. This will make the move toward HDTV financially viable and esthetically pleasing.

Background

The Federal Communications Commission's has established an eight-year transition timetable for broadcast licensees to move from NTSC (National Television Systems Committee) format to the all-digital ATSC (Advanced Television Systems Committee) standard. There are, however, compelling economic reasons for broadcasters to accelerate their entry into Digital TV. Speed to market allows broadcasters to establish their presence and develop expertise in DTV operations.

The three leading DTV formats have different strengths. The 1080-line interlaced format is a high-definition approach, as is the 720-line progressive format at 60 frames per second (fps). These formats gobble up almost all or most of the 6 MHz channel capacity, allowing broadcasters to deliver one-channel of video – into a world that will have a veritable handful of receivers for the next few years.

The 720-line progressive format at 24 frames per second also offers high definition capability, and is also completely compatible with filmed entertainment, the primary source of broadcast programming (theatrical movies, made-for-TV movies, most TV dramas and sitcoms)

The 480-line progressive format at 60 frames per second delivers flexible video and data options. These spectrum-efficient formats – 720-p/24 fps and 480-p/60 fps – are also called High Definition Level Zero (HD0); as the name suggests, this is a starting point toward future HDTV options.

These formats are among the 18 Digital TV formats authorized by the FCC in 1997. As broadcasters determine which technologies to embrace, they face a fundamental decision: whether to concentrate solely on High Definition TV or explore other revenue-producing applications for their digital bandwidth, most likely in the SDTV sector. If broadcasters choose the latter, they must then devise new business models, based on the different needs of the multicasting/data delivery world.

HD0 is an inexpensive entry point to Digital TV, offering the quality of Standard Definition Television (SDTV) and allowing easy migration to HD1 High Definition Television (such as 720-p/60 fps) as market conditions warrant. The costs of HD0 studio/production and transmission equipment is just slightly higher than the replacement costs of NTSC gear. Installation of 1080-i

technology will cost considerably more, although pricing of all Digital TV hardware is currently in a state of flux.

Looking for clues about possible new lines of business leads to the Internet, World Wide Web and the broader realm of computer-based interactivity. Nearly 25% of U.S. households regularly use the Web and are familiar with its interactive capability. There is also a growing trend to blend television and Web content, as evidenced by the 25% of PC households in which a TV set is in use while the viewer is working or playing on the PC in the same room.

Of course, this entire debate about technology and standards comes down to a guessing game about what viewers want to watch. A Verity Group Inc. study in early 1998 concluded that viewers are **not** interested in seeing conventional programs in HDTV format; viewers said that program quality has to improve along with the broadcast signal in order encourage them to buy higher-definition TV receivers. Several other studies confirm that better sound and visual quality will not drive DTV acceptance in the near term.

This challenge makes it even more essential for broadcasters to develop an alternative revenue model – i.e. not just HDTV video programming – to create a viable business during the DTV transition period – and for decades afterwards.

A Few Definitions

Digital TV: A technology for transmitting programming, replacing the "analog" technology previously used in TV transmission. It is based on circuitry in which data carrying signals is limited to either of two voltage levels, corresponding to 1 or 0 (on or off).

ATSC: Advanced Television Systems Committee. An industry organization that established 18 voluntary video formats, known as Table 3. The U.S. digital TV transmission standard uses MPEG-2 video compression and audio compression so that a wide variety of source material, including computer data, can be accommodated. The ATSC standard is an outgrowth of the "Grand Alliance" industry effort to establish Digital TV standards.

High Definition Zero (HD0): A set of formats based on the ATSC Table 3, established as the initial stage of digital TV rollout. HD0 encompasses four display formats; it is scaleable to HD1 and HD2, which will offer a greater array of total lines per frame and frame rate codes as market conditions warrant.

In this paper, HD0 is identified as an entry platform that allows broadcasters to develop immediate revenue streams, while preparing for eventual delivery of High Definition TV resolution.

INTRODUCTION

A New Kind of Television

For nearly 10 years, the introduction of digital television (DTV) has been couched in terms of a "transition," often comparing this analog-to-digital migration with the shift from black-and-white to color TV during the 1960s.

The DTV shift is far more dramatic. It is more akin to the arrival of television in a radio world, especially in the programming realm. Fifty years ago, many entertainment and information formats transitioned easily from radio to TV: sitcoms, variety programs, soap operas. Adding visuals, however, created entirely new genres of programming, drawing on other media such as theatrical films, newsreels and variety/stage shows.

The tools and content of today's digital environment make it possible for broadcasters to re-invent their medium, not merely enhance it.

By taking advantage of the creative strengths from other media – from videogames to customized Internet information services – broadcasters can develop entirely new programming and revenue streams. At the same time, digital TV lets broadcasters continue to do what they do best: deliver national and local programming in efficient and well-packaged formats to their viewers.

Facing New Decisions

Digital TV forces broadcasters to confront new kinds of decisions, ones for which there is little or no precedent. These choices go beyond "apples vs. oranges" conundrums. The perceived focus is on selecting a format – be it 1080-i, 720-p or 480-p. The real decision, however, involves far more substantive issues:

- Stick with a comfortable, familiar business: single-channel, one-way advertising-supported video broadcasting,

- Or plunge into unknown worlds of multichannel TV and data transmission, cultivating user fees, transaction payments and other untapped revenue sources.

Situations like this force broadcasters – and their suppliers – to explore entirely new business models. This is not just about technology, but also about investment levels, installation timetables and speed to market.

Focus the debate: It should be noted that the current debate about technical standards deals with transmission and decoding of Digital TV signals – not the acquisition/editing/display of programming. Indeed the production and editing of DTV can be done in almost any format and down-converted (see below) into the appropriate transmission format. This situation gives broadcasters maximum flexibility in selecting studio and post-production facilities. It also allows broadcasters to make their decisions about transmission technology independently from the mandates of production considerations.

The Right Place to Begin a Migration

By the Spring of 1998, broadcast licensees, networks and equipment makers were anguishing about the timetable for introducing digital TV service in the U.S., and whether it should be High Definition TV (HDTV), Standard Definition TV (SDTV), some combination of the two or something else altogether. The Federal Communications Commission's timetable calls for all stations to offer some digital services by 2003 and for the nation to convert to all-digital TV by 2006.

Barriers had already been identified: difficulty in erecting Digital TV towers, the expense of installing HDTV studio equipment, questions about simulcasting. The issue attracting the most attention, however was the debate about whether to transmit in 1080-i format, 720-p format or 480-p format. The1080-i format is strictly a High Definition TV approach. On the other hand, the more flexible DTV formats encompassed by HD0 are bandwidth-conserving alternatives. The 720-p format at 24 frames per second is especially compatible with filmed programming (the mainstay of prime-time TV), while HD0's 480-p offers flexible video delivery.

As the relative numbers suggest, the 720-p/24 fps and the 480-p formats (two of the HD0 varieties in the FCC's Table 3) uses a fraction of bandwidth required for the 1080-i format. HD0 allows broadcasters to deliver three to four channels of video (multicasts) and/or data streams simultaneously to digital TV sets, personal computers or other devices.

Advertising, sponsorships, user subscriptions or pay-per-use fees on these "extra" channels would mean that TV stations could create entirely new revenue streams from them. Although the revenue levels will inevitably be smaller than commercial income from the licensee's primary video channel, collectively the added channels could add at least 30% and maybe as much as 50% (or more) to a station's income. This is because some of the programs will be high-value shows and the data delivery services will be value-added products.

Developing a New Business Model

As broadcasters move into Digital TV, they face business-altering issues. Despite the belief of many station managers and owners, viewers do not merely want better video and audio quality (see below). Whether it is multicast video or data channels made possible by a format such as HD0, TV executives are confronting a change in business model. Factors to consider include:

- modifying the advertising assumptions: audience fragmentation (through a broadcaster's own multicasting or the continuing competition from cable, satellites, Internet, etc.) will continue
- identifying new salable content for the added channels, including syndicated and special-interest programming
- recruiting personnel to market niche services
- partnering with new allies.

Establishing this new business model requires broadcasters to evaluate the timetable for DTV adoption and realistic investment levels, so as not to build *too* far ahead of the market. That is, depending on the ability of a community to absorb the new digital services, a broadcaster should pace the timing of the company's move into advanced TV formats. This decision will be different for every market.

Timetable Favors HD0

The breath-taking allure of high-definition pictures have attracted many programmers and licensees to drift toward HDTV as the preferred initial application for the digital channels. However, there are fundamental reasons not to jump into HDTV:

- Reception equipment will be scarce. The Consumer Electronics Manufacturers Association and others who have vital stakes in the sale of new TV receivers admit (via their research) that fewer than 3 million households are likely to in HDTV receivers during the first four to five years they are available (i.e. through about 2002). That

sets up a chicken/egg scenario, in which it is barely feasible to create HDTV programs for such a small audience.

- The HD0 format establishes new lines of business (multiplexed channels, data delivery) almost immediately and allows quick migration to the HD1 format as local market conditions warrant.

Lack of Interest in HDTV at Local Level

Despite the publicity frenzy, FCC deadlines and equipment vendors' sales pitches, local broadcasters are maintaining their ennui about shifting to HDTV programming. Television Broadcasting magazine's semi-annual DTV Station Survey (December 1997) found that 71% of America's TV stations expect that the only HDTV programs they carry is "what [their] networks send" for pass-through, according to the chief engineers responding to the poll. Significantly, most of the stations that do plan to produce HDTV signals locally are in the nation's largest markets – further underscoring a politically undesirable "have/have not" scenario between the nation's big and small markets.

Significantly, about half (53%) the respondents in that sample expect to send program-related data, sports statistics and electronic coupons through their new digital facilities.

At the same time, a growing number of audience polls show similar apathy about HDTV. Odyssey Inc.'s recent study found that consumers want more choices far more than they desire a marginal improvement in picture and sound quality. Simultaneously, the Verity Group Inc. research confirmed that viewers' primary appetite is for better quality programming, not just HDTV features; this survey suggests households won't buy HDTV equipment merely to see the same familiar shows. One set of focus groups judged the 480-p format as "brighter, with more contrast" than the 1080-i format

Obviously studies like these are conducted in a relative vacuum, since viewers have not experienced HDTV as part of their regular, daily pattern. They may be turned off by reports they hear about high prices; most cannot envision the full video line-up in HD format, even though they may see extended samples of programming during the research project.

Nonetheless, the remarkable consistency of these research findings – among broadcasters and viewers – raises concern that HDTV will evolve into American households over a rather lengthy timetable: certainly longer than the FCC's mandate that sets 2006 as the target for an all-digital TV environment.

What Do Audiences Want?

If not HDTV, then what do U.S. households expect to see from this new digital TV service? The Internet and World Wide Web explosion of the mid-1990s offers a small glimpse about ways in which the audiences of tomorrow will use media. In this case, "audience of tomorrow" is a very literal term, referring both to the pioneering Web-heads who have set up ad hoc interactive systems today and the next generation of viewers (today's teenagers) who have used videogames devices, PCs and other digital equipment their entire lives; these youngsters will come into the home-formation/equipment-buying phase of their lives during the next decade of DTV transition.

Viewers are already watching TV and PCs simultaneously. Today, such multitasked viewing is generally achieved by using two different screens in the same room. Several recent surveys have found that in U.S. homes with a personal computer, half of those households **also** have a TV set in the same room. Moreover, half of those dually-equipped people say the TV set is on while they are using the PC.

These significant new styles in viewing behavior underscore the opportunity of new Digital TV services. Systems that combine PC and TV applications will find an immediate audience, and growth will be sizable as new multitasking audiences emerge. Multicasting fulfills customers' interests today and paves the way for future digital services.

Viewers are already multitasking

Several studies have confirmed that more than 20 million U.S. homes have a PC and TV set in the same room (i.e. half the nation's PC-equipped households have a TV set co-located near a home computer). Whether it's in an efficiency apartment, a family room/den or home office, the adjacency of two popular screens makes sense.

Moreover, whatever it may mean about the style of U.S. household decor, about 20% of PCs are in American living rooms, according to Jupiter Communications research, and about 15% are in the bedroom.

PC users may use the TV set as video wallpaper or for companionship while they do homework or play videogames; they may watch TV while waiting for Web pages to download. Or increasingly, they may be logged onto the Web to respond to TV shows that spur Web usage. Shows such as NBC's "Homicide" or the recent CBS "Skate Debate" specifically encourage Web users to multitask between the TV show and the associated Web site. During the 1998 Super Bowl, an advertisement that asked viewers to answer a question via the Web generated more than 500,000 responses.

References to Web sites during TV programming (e.g. a newscaster's recommendation to look up details on the station's Web site or a URL that appears during a commercial) consistently generate spikes in usage of that Web page. Although quantitative research about the relationship between TV viewing and Web usage is sparse (and proprietary), network executives acknowledge that they constantly see increased traffic on the network's Web page within moments after such cross-references. One executive interprets that rapid response to the fact that viewers not only are in the same room with their PC's but also that the PCs are already turned on – and probably logged online.

The Price Barrier

Prospective Digital TV viewers – even the cost-insensitive early adopters – have cringed at the prices for DTV receivers. TV manufacturers have announced prices in the $5,000 to $12,000 range for the first DTV sets to come to market in late 1998, with a negligible drop in prices during the first 18 to 24 months of rollout.

Meanwhile, the price of the home adapter (decoder) box poses another barrier to mass market introduction. The price of 1080-i home decoders may be in the $500 range initially. On the other hand HD0 equipment will cost $200 or less – possibly underwritten or distributed free to customers of the new digital interactive services. Hence, HD0 represents a low-cost/high-volume mainstream opportunity.

Beyond the Technology

The Issue is Open

The Advanced Television Standards Committee (ATSC) plan for digital TV in the U.S. specifies 18 different digital formats that range from the resolution of today's NTSC standard to a theater-quality high-definition display.

The HDTV formats are up to six times the data size of today's standard definition video. While visually stunning, the HDTV displays are overkill for many viewers. As many experts from the broadcasting, consumer electronics and computer industries acknowledge repeatedly, any of the DTV formats far exceed the visual quality of NTSC.

The increasing purchases of large-screen TV sets (larger than 31-inch diagonal measure) figure into advanced TV development. Although large-screen and projection TV are the fast-growing (and highest-margin) sectors of the TV set retailing business, their numbers are still relatively small – perhaps 20% of the entire market. Experts say that HDTV quality is not discernible on monitors

or project TV sets smaller than 50 inches. In other words, HD0 signals would be equally vivid (albeit not necessarily in wide-screen dimensions) to the overwhelming majority of viewers. Only a tiny fraction of TV viewers will actually see purchase very large-screen sets to be able to see high definition TV in the next few years (under 500,000 homes in 1998, fewer than 3 million by 2001).

The HD0 format, as a foundation, creates the opportunity to reach viewers almost immediately and still provide a scaleable path toward high-definition TV during the coming decade. As broadcasters move from the HD0 format to HD1 (which encompasses the 720-p/60 fps format), they will be able to serve 17 of the 18 ATSC formats.

Progressive Is Inevitable

The benefits of progressive format are underscored in several ways. Five of the six ATSC HDTV formats are progressive, basically because film material can be automatically transmitted using progressive scan. Since filmed programming (including movies) constitutes at least 70% of prime-time content today, it is most efficient to use the progressive format.

The HD0 format fulfills many of the same requirements, although it is not an HD format. It provides double the temporal resolution (for fast moving scenes) and enhanced (flicker-free) spatial resolution for text and stationary images. Except on very large displays, the HD0 format will provide picture quality virtually indistinguishable from transmissions in the 1080-i/30 frames-per-second format.

Joe Flaherty, the CBS senior vice president for technology, who has been called "the father of HDTV," has been a vociferous advocate of the 1080-i system. Yet in a recent interview, even he acknowledged that "within the next five to eight years, [video] will be progressively scanned for all pictures. And that will happen sooner, rather than later, on the production side." (Quoted in Digital Television Magazine, March 1998, page 8).

Down-Converting Allows Station Evolution

Broadcasters who want to build for evolution toward HDTV have an easy and immediate option. Facilities to down-convert programs from 1080 or 720 line formats into the HD0 format are competitively priced and will be widely available. (During March 1998, many vendors previewed down-converting equipment, although pricing information was generally withheld until the National Association of Broadcasters convention in April 1998.) The sizable number of suppliers suggests stiff competition – hence reasonable prices – for such down-converters.

Local productions or network feeds that are created in HDTV formats can be efficiently modified for transmission in the 480-p format, receivable by the handful of early Digital TV sets in homes and by viewers with adapters (set-top decoders) to watch digital programs on existing NTSC sets.

What Kinds of Programs?

Linear News and Entertainment Survive

Nothing beats good story-telling, whether it is dramatic, comedy, educational or news/information. Hence, linear, narrative entertainment programs are likely to remain a mainstay of Digital TV – at least on the primary channel. These shows plus special events and sports will constitute the bulk of the content of a broadcaster's primary Digital TV channel.

The opportunity of SDTV and eventually HDTV becomes the curious challenge of this new business. The past few years of World Wide Web experience has whetted appetites for a new kind of programming. Broadcasters can learn from the Web, identifying the kind of merchandising, entertainment and information services that appeal to digital-era customers.

For example, the success of Sony Online Entertainment underscores the ways in which a programmer can exploit familiar brands onto a new platform. Through its Columbia Pictures subsidiary, Sony controls TV shows such as "Jeopardy" and "Wheel of Fortune." That have been converted into popular online, play-along games that appear on the "Sony Station" Web site. Recently, Sony Online Entertainment reconfigured its entire site to build and expand the interactive entertainment content, leveraging its familiar brands and creating an advertising environment for mainstream products and services (such as Kellogg's, Sears and American Airlines). Sony is also developing a new revenue stream, creating online pay-per-play multi-player games.

These are lessons that can be transferred to the Digital TV arena, which will have the advantage of larger bandwidth, albeit the restriction of limited return path for true interactivity.

Program Possibilities

Digital TV can also be the basis for dozens of new programming and transaction-based concepts. Many of these examples fall into the "repeat business" category. The changing nature of the content (whether it is traffic, classified advertising or high definition video wallpaper) entices viewers to tune in frequently.

This may challenge broadcasters to find new kinds of advertisers for these services – i.e. merchants or manufacturers who have traditionally NOT come to TV because of cost or limitations of 20 second, 30 second or 60 second commercials. Moreover, the direct-marketing aspects move broadcasters beyond the role of selling advertising and into the transaction business – the fastest-growing segment of the marketing world.

In a multicast environment, programs can be customized or time-shifted. Custom programs actually provide a potentially vital factor for public policy action. If, for example, broadcasters created "zoned newscasts" (featuring extended reports about neighborhoods or communities around the metro area), these extra channels might qualify for "must carry status" on regional cable TV systems – setting a precedent in the on-going battle about whether cable is required to find channel space for broadcasters' multicast DTV signals.

In addition to news, weather, sports, traffic and finance – all of which can leverage the station's brand -- several other categories of content open up as value-added content on the digital platform.

Broadcasters can find new revenue streams by using the extra bandwidth to offer play-along games, electronic commerce (shopping), and classified advertisements – all of which create a transactional revenue stream.

Fashion shows, cross-promotions with national or regional merchants, also suggest transactional opportunities. On the close-circuit front, various types of leased channels (including video or data feeds that are encrypted for private use) can transmitted on the extra bandwidth available in the 480-p format.

Subscription (pay) TV poses a thornier problem, at least initially. Under FCC rules, a portion of revenues generated by such a service would have to go back to government in consideration of broadcasters' free use of spectrum space.

Putting the Opportunities in Perspective

Opportunities	Functions/Markets	Costs	New Revenue Sources
VIDEO: Multicast channels			
Enhanced Broadcasting			
Time Shifting	Stagger start-times; rerun programs	Licensing fees, playback equipment	Advertising

"Zoned" newscasts	**Localized reports, akin to newspapers; target advertising; may force cable "must carry"; zones could also be demographic, rather than geographic**	**Small increment to current news budgets**	**Neighborhood advertisers who cannot afford metro-wide TV**
Stocks/Finance	Video updates of market news, financial analyses; opens day-part market	May be supplied by brokerages, investment services	Advertising to valuable high-end viewers; sponsorship by investment firms
Weather/Sports	Statistics, constant updates; automated or live reporters. Seasonal alerts	Small increment to current budgets; leverages station brand	Bonus circulation for existing advertisers; new advertisers who don't buy on main newscasts
Enhanced Video	Add-on to primary video program; background material; highlights; instant replays; extra footage from interviews/news	Small increment to primary production; editing; promotion	Targeted advertising, subscription, sponsorship
Leveraging Existing Broadcast Content			
Traffic	Automated traffic cameras and/or live round-the-clock reporters	Minimal	Automotive, mass transit advertisers.
Special Interest	Niche programs; created locally, from archives, from distributors; foreign language programs	Minimal; barter	Advertising, barter; may be pay-per-use or subscription
Education	Class lessons; homework help; schools; students	Minimal; schools supply video, staff	May be offered as community service; education/civic grants
Creating and Delivering New Content			
Children	Entertainment, enrichment; play-along games	Leverage existing shows, exploit archives	Advertising
Children's Museum	Highlights of local museums	Borne by institutions, students	Local sponsorship, grants

Music/Film clips	**Theatrical previews; music videos**	**Almost none; material supplied by vendor**	**Advertising; revenue split from sales of CDs, theater tickets**
Untapped Advertising Opportunities			
Video classified ads	**Auto, housing (apartments), jobs**	**Create/maintain databases; produce video footage**	**Untapped advertising payments; production fees; commissions on sales**
Automotive	Car-finder services; "virtual test drives"; dealer promos; bonus for automotive advertisers	Leverage existing ad production relationships with auto dealers, repair, supply	Advertising; "finder fees" for matchmaking
Shopping; Fashion	Retail "walk-throughs"; local or national merchants offer fashion shows, real-time ordering	Production of special events	Advertising; commissions on sales; fees for special programming
Direct Marketing	Merchandise sales; cyber-shoppers	Processing center (out-sourced)	Transaction fees; placement revenue
Ancillary Services			
Leased channels	Part-time or full-time lease to local business, institutional customers for open or closed-circuit feeds	Marketing/promo to prospective users; customers supply programming	Channel lease; possible production revenues
Politics/Government	Public agency presentations; meetings; electronic democracy	Leverage existing news coverage; agencies may supply video feeds, promos	Leased channel fees
Directories/tourism	Listings, events, city guides; promotional videos of local attractions	Reuse of archives, material supplied by attractions; editing costs	Advertising, placement fees; reservations/trans-action fees
Pay TV	Movies, sports, concerts, special events	Purchased from various sources	Subscription fees; portion of revenues may have to be turned back to government

Interactive TV	Play-along with show; viewer-controlled experiences; encourages viewer retention	Small increment to existing production; leverages relationship	Targeted advertising premiums; sponsorships; user fees
Pooled channels	Many broadcasters within a market pool their "extra" spectrum to create 20+ channels; competes with cable	Technology, promotion; purchase shows from cable/DBS producers/distributors	Subscription; competitively priced against local cable

Data Services

Download data	Transmit computer files and software to home/business users	Marketing; packaging; installing secure transmission devices	Usage fees
Web site downloading	Package and distribute Web content	Transmission equipment	Usage fees
E-Commerce	Transmit merchandise and service offers to PCs/home terminals	Transmission equipment, security software	Advertising; merchandising transactions; revenue splits
Games/Entertainment	Distribute PC games, multiplayer game software	Transmission equipment, marketing, security	Pay-per-use; entry fees; advertising
Program listings	TV listings to PC or TV	Addressable software	Advertising, subscriptions
City guides, directories	Local information, event listings, tourism bookings	Content packaging; buy or build content	Advertising, transaction fees
Financial data	Investment, market information	Resell from many sources	Advertising, sponsorships
Sports	Scores, statistics, line-ups, game results; station branding	Resell from many sources	Advertising, sponsorships
Weather/Traffic	Time information and forecasts; extend station branding	Resell from many sources	Advertising, Sponsorships

Advertisers Also Benefit

Targeted/Addressable Ads	Sends specific ads directly to target customers	No incremental production cost; minimal traffic expense	Premium ad rates for specific targeting; feedback; user data
Viewer Incentives	Viewers rewarded for watching/responding to specific commercials	Minimal production/ distribution (paid for by advertiser). Boosts value of viewership	Extra fees for reaching target audiences
Commercial Monitoring	Evaluation of commercial responses	Monitoring equipment (paid for by ratings service, etc.)	Ratings, research services pay for viewer data (collectively)
Interactive Ads	Added value via customized messages; selected by viewers	Minimal transmission costs in multiplex format	Premium fees for targeted advertising

Financial Factors

Investment Considerations

From an engineering standpoint, the costs of operating in 1080, 720 or 480 format are about equal. However, the price of 480-p transmission equipment is generally lower than the price of comparable 720-p or 1080-i devices. Actually 480-p transmission equipment (digital transmitter, antenna, transmission line) costs just slightly more than its NTSC counterparts.

While many factors affect the cost of installing Digital TV equipment in studios, transmitters and production facilities, the 480-p set-up usually comes in at the low end of the $6 million to $10 million range cited as the price for "going

digital." The basic 480-p structure can easily be ramped up to handle 720-p as the market for HDTV develops.

The prices of digital transmitter studio equipment are expected to fall rapidly – probably even faster than today's 20% annual price decrease. At some point, the new digital equipment may be barely 20% higher than today's comparable analog facilities. That makes it even more cost-effective for broadcasters to implement their DTV purchases in a scaled process. By acquiring DTV equipment as the local market matures, broadcasters can meet regulatory and viewer expectations at each stage of DTV development – i.e. not front-load purchases to create a costly top-of-the-line studio too soon.

Again, this is a matter of timing. As current capital assets reach the end of their amortized life and they are abandoned, the replacement equipment will be bought in terms of its DTV capability. Through thoughtful purchasing tactics, broadcasters can provide HD0 level transmissions almost immediately at relatively low investment levels, then move up to HD1 level as the market and audience grow.

Production

Studio and post-production equipment for HDTV can range from 20% to 100% higher than for current studio equipment: one very-high quality HD studio lens cost about a quarter-million dollars, although serviceable lenses are available in the $30,000 range.

The HDTV cameras are considerably over-sampled compared to NTSC cameras. This means that broadcasters can build an archive of HDTV material for future use while at the same time offering a higher quality SDTV programs to viewers.

Storage and Hosting Facilities

To maintain, manage and present its new digital content, stations will install video servers and associated equipment. Initially, this will be a digital library, from which production and operating personnel can pull appropriate content (programs, commercials, ancillary information) and convey it to the transmitter.

Eventually these servers can be structured for on-demand delivery, allowing viewers to request specific material to be transmitted at a specific time or to specific households. Operating somewhat like a video jukebox, this digital server could be used for entertainment, shopping, news and other applications.

The equipment typically costs $100,000 to several million dollars, depending on the storage capacity and processing power.

These servers will be at the heart of future interactive and on-demand video services.

Down conversion

The combination of DTV cameras and high-quality down-converters will create better quality SDTV pictures. Down-converters at the post-production facility or in the station's operations center can transform High Definition productions into SDTV signals. The cost of these down-converters is also competitive and highly negotiable. Down-converters will be needed almost immediately, as stations and networks transfer filmed programs into SDTV format.

Note that down-conversion at the broadcaster's end is quite different from the set-top decoders which will convert DTV signals so that they can be seen on existing NTSC receivers. This HD0 decoder box – expected to cost under $200 – will receive the digital signals in all ATSC formats and convert them into sounds and images that can be displayed on the current installed base of TV sets.

There is also a small but growing audience of viewers who watch TV on their PCs. The expected widespread installation of videocards into new PCs in the next few years (creating a Plug-and-Play audience of desktop TV watchers) adds another market opportunity for broadcasters seeking to reach the work-at-home market.

The Business Model

Establishing New Revenue Sources

To take advantage of the new Digital TV Opportunity, broadcasters can do two things:

- offer high definition programming which will barely be seen and generate little ancillary revenue for the next few years (at least)

- offer some HDTV, but multiplex their bandwidth to create entirely untapped revenue from transactions, new advertising and users fees.

Broadcasters and their allies can set up new structures to handle the increased programming options. Fees for special-interest or business-oriented services can be established competitively vis-à-vis existing services. For example, if several stations in a market chose to pool their added SDTV bandwidth into a multi-channel video package, their pricing and service offer could be priced competitively against a basic cable TV program tier with comparable program selections.

Data broadcasting services or Web bundling offers can be priced to compete with Internet access providers or other local data delivery systems.

The arrangements may require broadcaster to explore creative alliances and partnerships – often with companies from different backgrounds in transaction processing and data services.

The Shopping Option

Shopping is a good example of a migration path from simply airing commercials into profiting from the transactions and product sales. Direct marketing (mail order, catalog shopping) became the focus of "the new retailing" in the 1980s because of its measurable results and its ability to create a new audience of time-pressed shoppers. At the heart of Direct Marketing's appeal is the ability to measure sales by cost-per-transaction or cost-of-sale, rather than the useful but somewhat less precise advertising guidelines of cost-per-thousand in audience reach.

The lessons of Direct Marketing have formed the basis of much of the e-commerce on the World Wide Web. And in turn, those experiences can be transferred to the bigger bandwidth of Digital TV – creating a challenging new line of business in which broadcasters can get a "piece of the action" on transactions conducted via their bandwidth.

Several studies in early 1998 confirmed that American Web users are willing to make the move to transactions. Odyssey Research's "HomeFront" study of home computer users behavior, found that 30% of online households have made a personal purchase from home, up 50% during 1997. That data translates into 7 million homes that bought something (probably a book or airline ticket) online in the last six months of 1997, more than double the 3.2 million households that shopped online in the last six months of 1996.

Another study by @Plan found 24% of Web users shopping online. It identified a 300% jump in the number of people buying airline tickets, stocks or mutual funds online during the period from mid-1997 to March 1998.

These huge new interactive sales industries – generating $1 billion in sales in 1997, expected to quintuple by 2002 – hint at the opportunity awaiting broadcasters. Creative alliances and participation in broadband merchandising represent entirely new business opportunities.

The value is in the bandwidth. The revenue is in these new digital services, not (for the foreseeable future) in HDTV sight and sound.

Conclusion

To HD or not to HD? That is really the question!

The U.S. media environment has changed dramatically in the decade since the Advanced Television Advisory Committee began its standards-setting odyssey. The rapid adoption of digital satellite TV, the mass-marketization of personal computers and the subsequent boom in online (Internet) usage has caused an upheaval in the way Americans look at the multiple monitors around their homes.

The future of television is not necessarily built on the legacy of analog TV programming. Viewers may be comfortable with familiar video structures: sitcoms, dramas, news/information magazines. But there is no indication that consumers want to see those programs in HDTV format – nor that Americans are willing to pay the premium prices to acquire HDTV receivers.

Given that market reality, broadcasters have a better opportunity to generate near-term revenue – and improve their own digital learning curve—by using the DTV bandwidth for creative new business services. By using the efficient HD0 formats, stations and networks are ready to expand into HDTV when the market is ready. In the meantime, broadcasters can experiment and explore other video and data services at reasonable investment levels.

Competition from satellites, cable and telephone companies has changed the nature of broadcasting. TV stations, with their new digital bandwidth, have the chance to battle back. Broadcasters cannot afford to use DTV merely as a single channel for more of what they've always offered.

DTV is a path into entirely new businesses. HD0 is the gate onto that path.

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About the Author

Gary Arlen is President of Arlen Communications Inc., a Bethesda, Maryland, research firm specializing in new media applications. He has been analyzing the development of communications, information and entertainment technology and services for more than 20 years. Gary has edited and published industry newsletters about the video, satellite, cable and interactive systems; his commentaries about these topics appear in leading periodicals worldwide.

Gary's first glimpse of High Definition TV in 1981 encouraged him to continue monitoring the regulatory and business development. He has tracked HDTV and other digital services in connection with his examination of the convergence of applications and technologies for consumer services. Clients of Arlen Communications Inc. include media and telecommunications companies, financial and retail organizations, program producers and technology suppliers.

Prior to establishing Arlen Communications Inc. in 1980, Gary was on the staff of the American Film Institute, AT&T, the National Cable TV Association and Paul Kagan Associates. He is a graduate of Washington University and holds a Master's degree from Northwestern University. He has been an adjunct professor at American University and has lectured at Harvard University, the Massachusetts Institute of Technology, as well as numerous telecommunications and media conferences.

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